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Long Term Evolution and its Handover Mechanism

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Abstract
LTE technology wascommercially introduced byTeliaSonera in Norway in December2009. The abbreviation of LTE is Long Term Evolution.It is the third generation partnership project(3GPP).It is also developed widely by international organization.LTE is developed to support both the time division duplex technology(TDD) as well as historical information. The Architecture of high level network technology LTE is obtained from the three main point's 1.The user Equipment, 2.The Evolved UMTS Terrestrial Radio Access Network(E_UTRAN)and 3rd is the (EPC)Evolved PacketCore.Handover mechanism is published to be used in 3GPP LTE in orderto reduce the complexity of LTE Network architecture.The Standards isdeveloped by3GPP and is specie in its release 8 document series, LTE is the natural upgrade path forbid GSM/UMTS networks and CDMA200 networks.A critical task for operators is to plain LTE network layer independently without losing the cooperation.

Key words:LTE, Handover, TDD

I. Introduction:

In this paper we aim to present a brief overview of 4G LTE technology in term of history, architecture,handover mechanism,standards and operational mechanism.The "G" in the wireless network refers to generation. Technically many types of generation may be discussed as below.

- 1G Network:are considered to be the 1st Analog cellular system. Whichstarted early in 1980s. There were in a radio telephone system even before that.1G network was purely designed for voice call [1].
- 2G Networkwhich started early 1990s. Improved sound quality, better security and total capacity.
- 2.5G Network:Are the enhanced version of 2G Networks with theoretical data rates upto about 144kbit/s.
- 3G Network:Are newest cellular network.Its data rate is having 384kbit/sand more.
- 4G Network: It refers to the fourth generation of mobile phone communicationstandards.LTE and WIMAX are marketed as the part of this fastest generation. This fastest 4G LTE technology delivers downlink speedof 1Gbps when stationary and 100 Mbps with mobile.

LTE organize layer is exceptionally the radio get to arrange and the advanced bundle core,must work autonomously however participate with each other.A complex errand for system fashioners adjusting LTE services,as well as movement and portability management.Wireless 4GLTE is foundation. Past the physical LTE 4G arrange most administrators partition their association and exercises so duties regarding the radio get to network can be isolated from tower interconnection or from administration. In a reasonable sense LTE arranging begins with the radio get to organize (SDR)technology is proficient for supporting both 3G and 4G innovation in the range band. When new cell is added it insure that it life time is maximized.LTE 4G is must consider as a target service and is derived from 3G and thereforethere is a temptation to think replacing 3G on per cell [2]. A final point in the layerlayer by layer review for LTE planning and design must insure thatall of the components especially RAN and EPC component properly link with service control and registration logic.

LTE is a heterogeneous network.is a promising way of forward tomeet the anticipated wireless broadband capacity challenge [3].Alarge numberof nodes will be deployed and these form different number of coverage layers. Compared to a traditional macro only deployment, it is more challenging from the handover point of view because of much higher handover frequency and more complex handover situation. LTE technology is to save (OPEX) and to improve networkperformance.Handover is directed to the cell identified in the measurementreport.The handover performance within a cell pair depends on many externalfactors that donot influence the measurement report generation such as the interference and shadowing distribution within the handover region.A successful handover procedure in

LTE includes HO trigger and HO Execution.HO Trigger includes measurement repeats and is received in the serving cell.

II. History of LTE

1. GSMA 2014 Dan Warren, Senior Director of Technology, GSMA A brief history of LTE And a little look to the future © GSM Association 2014

2. GSMA 2014 Generation Next 2

3. GSMA 2014 3GPP status Rel 8 Rel 9 Rel 10 R11 and beyond E-UTRA (LTE radio) – OFDM, MIMO, FDD and TDD IMS support for eCall, LI Higher order MIMO, Multi Carrier bonding More Multi-carrier options.

4. GSMA 2014 LTE Status 4

5. GSMA 2014 LTE investment Industry Capex will be focused on LTE to 2020 and beyond ~US$1.7T in 4G networks through 2020 Source: PWC / IHS iSuppli Mobile and Wireless Communications Service / GSMAi Industry Capex, Bn USD 6% 3% - 79% 47% 35% 25% 15% 5% 1% 15% 50% 65% 75% 85% 95% 99% 99% 95% 1% 5% 185 194 223 243 249 252 255 264 271 2012 2013 2014 2015 2016 2017 2018 2019 2020

6. GSMA 2014 All Paths Lead to LTE (eventually) GSM PDC 1 x TD-SCDMA HSPA+ / HSPA / WCDMA LTE EV-DO: Rev A / Rev B

7. GSMA 2014 Islands of coverage Chipset challenge LTE WCDMA EV-DO 1XGSM TD-SCDMA LTE LTELTE LTE GSM GSM LTE LTE EV-DO WCDMA WCDMA 1X

8.GSMA 2014 Multiple bands E-UTRA Operating Band Uplink (UL) operating band BS receive UE transmit Downlink (DL) operating band BS transmit UE receive Duplex Mode FUL_low – FUL_highFDL_low – FDL_high NOTE 1: Band 6 is not applicable NOTE 2: Restricted to E-UTRA operation when carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the carrier aggregation configuration that is supporting the configured Pcell. From 3GPP TS 36.101 v12.1.0

9. GSMA 2014 Deployment becomes Ecosystem VoLTE - 'Green Button' Voice service – Requires full interconnect, Roaming, QoS support end-to-end – Launched by 4 operators, 23 operator launches in 2014. Same full interconnect experience for new, operator supported person-to-person services 9 LTE Roaming – Global mobility – Over 40 operators with at least one Roaming agreement commercially launched. – IPX providers rapidly enabling many more agreements Device and Chipset manufacturers winning the 'Spectrum Fragmentation' battle. – Multi-band, multi-mode devices becoming the norm

10. GSMA 2014 Achieving the goal GSMA: Continue to lobby for Spectrum. Operators: Deploy quickly to meet customer demand for bandwidth 10 Operators: Sign Roaming agreements to build service Chipset/Handset Vendors: Support multi-band requirements to expand coverage Operators: make VoLTE and RCS 'must have' services for networks and customers Vendors: support standards for operator-to- operator interconnect, to allow Green Button Model to be extended to all services. Deploy Roam Interconnect

III. Comparison between Different Generations

In the figure below, a comparison between different generations of cellular networks is shown [4].

Comparison

Technology	1G	2G/2.5G	3G	4G	5G
Deployment	1970/1984	1980/1999	1990/2002	2000/2010	2014/2015
Bandwidth	2kbps	14-64kbps	2Mbps	200Mbps	>1Gbps
Technology	Analog cellular	Digital cellular	Broad bandwidth /CDMA / IP technology	Unified IP &seamless combo of LAN / WAN / WiMAX and 4G	4G+WWWW
Service	Mobile telephony	Digital voice, short messaging	Integrated high quality audio, video & data	Dynamic information access, variable devices	Dynamic information access, variable devices with AI capabilities
Multiplexing	FDMA	TDMA/CDMA	CDMA	CDMA	CDMA
Switching	Circuit	Circuit, circuit for access network & air interface	Packet except for air interface	All packet	All packet
Core network	PSTN	PSTN	Packet network	Internet	Internet
Handoff	Horizontal	Horizontal	Horizontal	Horizontal Vertical	Horizontal Vertical

Figure 1: Comparison of Various Technologies

IV. Handover In LTE

Intra E-UTRAN handover is utilized to hand over a UE from a source eNodeB to an objective eNodeB utilizing X2 when the MME is unaltered. In the situation portrayed here Serving GW is additionally

unaltered. The nearness of IP availability between the Serving GW and the source eNodeB, and in addition between the Serving GW and the objective eNodeB is assumed.The intra E-UTRAN HO in RRC_CONNECTED state is UE helped NW controlled HO, with HO planning motioning in E-UTRAN [5].To set up the HO, the source eNB passes all vital data to the objective eNB (e.g. E-RAB properties and RRC setting) and UE gets to the objective cell by means of RACH taking after a conflict free technique utilizing a committed RACH preamble.The HO system is performed without EPC association, i.e. readiness messages are specifically traded between the eNBs. Figure 2 demonstrates the essential handover situation where not one or the other MME nor Serving Gateway changes.

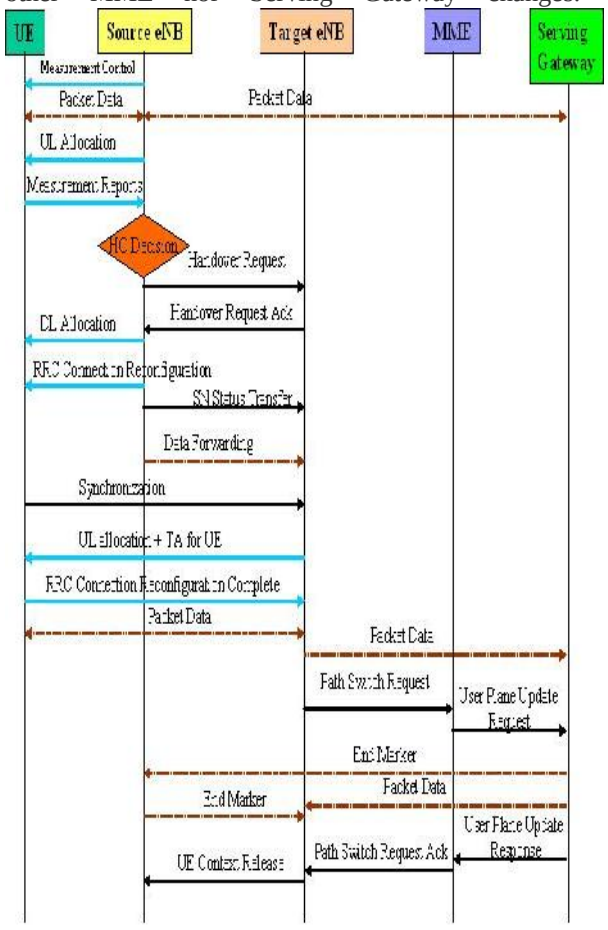

Figure 2: Handover in LTE

Nitty gritty clarification of above situation is beneath.

• The source eNB arranges the UE estimation methodology as per the territory limitation data. UE sends MEASUREMENT REPORT by the principles set by i.e. framework data, particular and so forth.

• Source eNB settles on choice in light of MEASUREMENT REPORT and RRM data to hand off UE and issues a HANDOVER REQUEST message to the objective eNB passing important data to set up the HO at the objective side.

• Admission Control might be performed by the objective eNB subject to the got E-RAB QoS data to improve the probability of an effective HO. The objective eNB arranges the required assets as indicated by the got E-RAB QoS data.

• Target eNB gets ready HO with L1/L2 and sends the HANDOVER REQUEST ACKNOWLEDGE to the source eNB. The HANDOVER REQUEST ACKNOWLEDGE message incorporates a straightforward holder to be sent to the UE as a RRC message to play out the handover.

• The UE gets the RRCConnectionReconfiguration message with fundamental parameters (i.e. new C-RNTI, target eNB security calculation identifiers, and alternatively committed RACH prelude, target eNB SIBs, and so on.) and is told by the source eNB to play out the HO.

• The source eNB sends the SN STATUS TRANSFER message to the objective eNB to pass on the uplink PDCP SN recipient status and the downlink PDCP SN transmitter status of E-RABs for which PDCP status conservation applies (i.e. for RLC AM).

• After accepting the RRCConnectionReconfiguration message including the mobilityControl Information, UE performs synchronization to target eNB and gets to the objective cell by means of RACH.

• The target eNB reacts with UL portion and timing advance.

• UE sends the RRCConnectionReconfigurationComplete message (C-RNTI) to affirm the handover to the objective eNB to show that the handover method is finished for the UE. The objective eNB confirms the C-RNTI sent in the RRC ConnectionReconfigurationComplete

message. The objective eNB can now start sending information to the UE.

• The target eNB sends a PATH SWITCH message to MME to illuminate that the UE has changed cell.

• The MME sends an UPDATE USER PLANE REQUEST message to the Serving Gateway.

• The Serving Gateway switches the downlink information way to the objective side. The Serving entryway sends at least one "end marker" bundles on the old way to the source eNB and after that can discharge any U-plane/TNL assets towards the source eNB.

• Serving Gateway sends an UPDATE USER PLANE RESPONSE message to MME.

• The MME affirms the PATH SWITCH message with the PATH SWITCH ACKNOWLEDGE message.

• By sending UE CONTEXT RELEASE, the objective eNB illuminates achievement of HO to source eNB and triggers the arrival of assets by the source eNB. The objective eNB sends this message after the PATH SWITCH ACKNOWLEDGE message is gotten from the MME.

• Upon gathering of the UE CONTEXT RELEASE message, the source eNB can discharge radio and C-plane related assets related to the UE setting. Any progressing information sending may proceed.

V. Advantages and Disadvantages

The focal points and hindrances of LTE innovations are highlighted in this area.

A. Advantages:

• LTE encourages the present applications to perform on better speed and additionally for the new versatile applications

• LTE diminish the movement of correspondence in term of sending information.

• LTE permits more clients to utilize a similar recurrence that bring about expanding of Mobile Broadband clients.

• LTE isolates frequencies into various direct keeping in mind the end goal to secure the unsettling influence of every channel; the arrangement was called "Orthogonal".

• LTE offers speedier information rate exchange as contrast with existing 3G arrange types of gear by utilizing radio waves over a similar data transfer capacity.

• LTE underpins more information limit since it concentrates on VoIP(Voice Over Internet Protocol).

• LTE permits remote broadband suppliers to move to this new innovation without remaking their whole systems starting from the earliest stage.

• LTE can likewise bolster voice and Short Message Service (SMS) content informing utilizing existing systems by means of Generic Access (VoLGA).

B. Weaknesses:

• The start-up expenses of specialist co-ops and purchasers for hardware redesigns are too high; new gear's will be should have been introduced.

• LTE innovation needs to utilize extra recieving wires at system base stations for information transmission. Subsequently to the system overhauls clients need to purchase new mobile phones to make utilization of new system foundation.

V. CONCLUSION

LTE is the fastest 4G wireless technology it avoided all those problemswho arises in the previous technologies. Its sendeng data speed is fast as compared as before technologies and is about 1Gbit/s and many more.Wimax include also in this technology.It supports multi band requirementsto expend coverage operators.WIMAX and LTE is well short of IMT advance standerd they are very diff from 3G networks and carries around the world refers as "4G" it furthure increase throughput respectively but neither been finalized yet.

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